International Journal of Computer Sciences and Mathematics Engineering Vol. 1 No. 2 (2022)
Published by: CV. HAWARI

International Journal of Computer Sciences and Mathematics Engineering
Journal homepage: www.ijecom.org

Effect of Retention Time On Quality Clarified Oil In Continuous Settling Tank (cst) at PT. XYZ

Yunianto[1], Koko Pratama Saragih[2], Darni Paranita[3], Donda[4], Mariani Sebayang[5], Erwin Pardede[6], Sorta Lumbantoruan[7], Bukhari[8]

[1,2,3,4,5] Department of Chemical Engineering, Politeknik Teknologi Kimia Industri, Indonesia
[6] Department of Oil Palm Agribusiness, Politeknik Teknologi Kimia Industri, Indonesia
[7,8]Department of Mechanical Engineering, Politeknik Teknologi Kimia Industri, Indonesia

Article Info

Article history:

Received Nov 07, 2022
Revised Nov 20, 2022
Accepted Nov 25, 2022

Keywords:

Clarified Oil
Continuous Settling Tank
Retention time

ABSTRACT

A One of the units at the clarification station is the Continuous Settling tank. Continuous Settling tanks area place where the crude oil is separated from the crude oil tank. Continuous Settling tank works for separate oil from sludge based on differences in specific gravity, where the lighter fraction is the oil is at the top while the heavier sludge is at the bottom. Retention time (time stay) is the length of time the oil is stuck in the CST tank starting from the time the oil enters until it exits tank. The longer the oil is in the CST, the greater the precipitation that occurs. so that the resulting separation is getting better and the sludge will settle to the bottom of the tank. The purpose of this study is to determine the relationship between retention time and percentage (%) dirt content, water content and oil content in clarified oil and find out the best residence time for produce CST oil output of the highest quality. This research was conducted with a variation of retention times 4, 5 and 6 hours . The results showed that the best quality of oil (clarified oil) was obtained at retention time of 6 hours with a yield of 99.499% oil, 0.475% water and 0.06% dirt.

Corresponding Author:

Yunianto,
Department of Chemical Engineering,
Politeknik Teknologi Kimia Industri,
Jalan Medan Tenggara No. VII, Medan, Indonesia.
Email: yunianto.mt.ir@gmail.com

1. INTRODUCTION

Palm oil processing is a processing process that produces coconut oil palm. The main products that can be obtained are palm oil, palm kernel, fiber, shells and bunches empty. The palm oil mill (PKS) in the context of the palm oil industry in Indonesia is understood as Crude Palm Oil (CPO) and palm kernel extraction unit from oil palm Fresh Fruit Bunches (FFB). PKS composed of process units that utilize a combination of mechanical, physical, and chemical treatments[1]. Important production

E-ISSN 2962-4274

parameters such as extraction efficiency, yield, product quality are very important its role in ensuring the competitiveness of the oil palm plantation industry compared to vegetable oils others [2].
Crude Palm Oil (CPO) is often referred to as crude oil or crude oil. Procedure processing of oil palm is a description of the process and mechanism of processing in each unit processing equipment since the fruit is received at the factory until it produces sufficient crude palm oil quality with technical and economic efficiency. The processing of palm oil into CPO is carried out inseveral stages, namely boiling, shelling, pulverizing, pressing and purification[3].
This content separator (purification) process is a continuation of the screw press process or process pressing where the oil palm fruit that has been pressed will produce oil, however The oil produced from the pressing process still contains a lot of impurities such as sludge, sand, silt and moisture content. This is what makes the palm oil mill continue oil refining process in order to get perfect oil quality[3].
The purpose of oil refining is to get oil of good quality and get a decent price on the market. One of the units that play a role in oil refining is a continuous settling tank (CST). In CST, the crude oil filtered is purified with the deposition process[4].
Continuous settling tank (CST) is a continuous tank type that can separate phases heavy and light phases while flowing from one bath to another. Separation that occurred through the process of deposition and is influenced by the force of gravity[5].
The deposition process occurs based on the difference in specific gravity between the fluids contained inside a CST[6]. In CST there are 3 kinds of fluids namely mud, water and oil. Based on the process of deposition of dirt and mud by utilizing the force of gravity, so that it is formed layers where the top layer is oil due to differences in density [7]. Layer formed from the bottom layer of sand, sludge and oil. On sand and sludge contains a few percent of oil so that due to the force of attraction there is oil the sand and sludge are also attracted to the top layer, namely the oil layer[8].
The process of deposition with gravity is influenced by several factors including particle size and shape, particle concentration, temperature and viscosity and length of retention time. The length of residence (Retention time) in the continuous settling tank (CST) is very important in oil separation efficiency and oil quality[9].

2. RESEARCH METHOD

The tools used in this study were 25mm Whatman filter paper, oven, desiccator, Vacuum Erlenmeyer Flashk Filtering, Vacuum pump oil, Gooch Crucible, Analytical balance, hose, spray bottle, Beaker glass, stir bar, hotplate and crucible pliers as well as for the hazards namely Clarified Oil (sample) and N-hexane. And the procedure as follows:

1. Dirt Content

a) Sample Preparation

The filter paper was put into the Gooch crucible and then rinsed using N-Hexane, filter paper and Gooch crucible are weighed using a balance analysis, Gooch crucible which contains filter paper is put into the oven for 30 minutes, Gooch crucible is put into the desiccator for 15 minutes, Gooch crucible and the filter paper were weighed again (A). The same experiment was repeated to get a constant value

b) Analysis of impurities content

Clarified Oil is weighed on an analytical balance in a beaker glass of 20 grams (C), Clarified Oil is heated on the hotplate until it reaches the boiling point and the hotplate is on extinguish until the Clarified Oil reaches room temperature, N-Hexane is added as much 150 ml and homogenized, the constant Gooch crucible was attached to the vacuum Erlenmeyer Flashk Filtering, Clarified Oil is slowly added to the Gooch crucible, Vacuum pump oil is turned on, Beaker glass is rinsed using N-hexane until there is no Clarified Oil left, rinse the Gooch crucible and filter paper no oil left,Gooch

E-ISSN 2962-4274

crucible dried in the oven for 30 minutes, put the Gooch crucible in the desiccator for 15 minutes, Gooch crucible weighed on an analytical balance (B) [10].

2. Moisture Content

The empty beaker glass is weighed on an analytical balance and the weight is recorded (W1), sample Clarified Oil is added as much as 10 into the beaker glass and the weight is recorded (W2), The beaker glass which already contains the sample is heated on a hotplate with a temperature of 105 C for 30 minutes and after completion the sample was put in a desiccator for 15 minutes, the Clarified Oil sample is weighed again on the analytical balance and the weight is recorded (W3)

3. Oil content

The oil content is obtained by calculating the quality of the water content and grade dirt [11].
Information :

$$dirt\ level = \frac{B - A}{C}\ x\ 100\%$$

A = Weight of filter paper + empty Gooch crucible (grams)
B = Weight of filter paper + Gooch crucible + Sample (grams)
C = Sample Weight (grams)

$$water\ level = \frac{W_2 - W_3}{W_2 - W_1} x100\%$$

Information :
W1 = Weight of empty Beaker Glass (gram)
W2 = Weight of empty Beaker Glass + Sample before heating (grams)
W3 = Weight of empty Beaker Glass + Sample after heating (grams)

Oil Rate = 100% - (% Dirt Rate + % Water Rate)

3. RESULTS AND DISCUSSIONS

No	Retention Time	Water content(%)	Dirt content(%)	Oil content(%)
1	4 h	0,634	0,027	99,339
		0,595	0,036	99,369
2	5 h	0,486	0,030	99,484
		0,517	0,027	99,456
3	6 h	0,463	0,027	99,510
		0,486	0,025	99,489

Based on the variation of retention time, i.e. 4, 5 and 6 hours, Clarified oil quality was obtained i.e. water content sequentially 0.614% , 0.502% and 0.475% , impurities content sequentially i.e. 0.032%, 0.029% and 0.026% and the oil content obtained sequentially is 99.354%, 99.470 % and 99.499 %. So the graph is obtained as follows:

E-ISSN 2962-4274

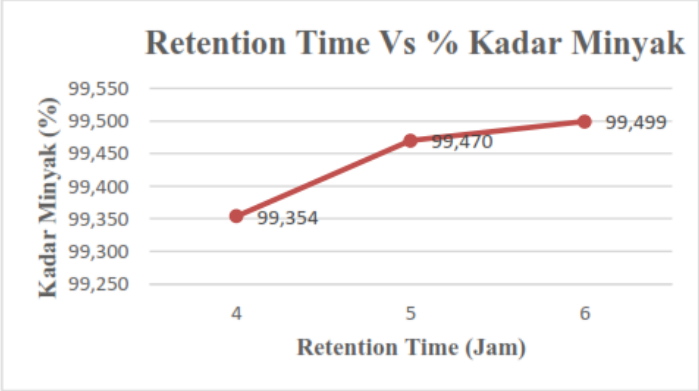

Figure 1. Graph of retention time VS % Oil Content

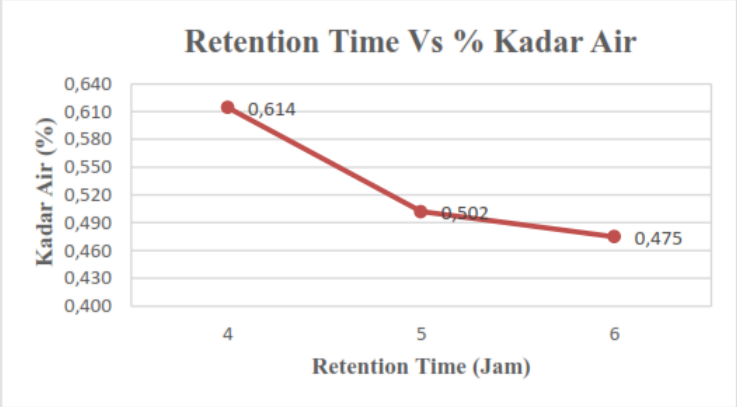

Figure 2. Graph of retention time VS % Moisture Content

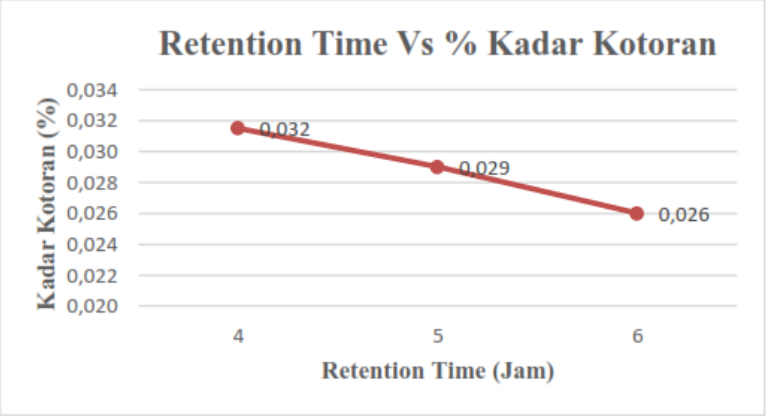

Figure 3. Graph of retention time VS % of impurities

Based on the graph, it can be concluded that the oil content in Clarified oil and retention time has a ratio that is directly proportional, where the longer the deposition occurs, the the more the percentage of oil while the water content and dirt content in Clarified Oil and Retention Time has a comparison that is inversely proportional, where the quality of the water content and the dirt content, namely the longer the deposition occurs, the less the percentage these levels come out of the CST.

E-ISSN 2962-4274

4. CONCLUSION

From the observational data from the results of field work practices and by processing the data as well calculation, it can be concluded as follows:

1. The relationship between retention time and the quality of palm oil (Clarified Oil) in Continuous Settling Tank, namely water content and dirt content over time (Retention Time) is inversely proportional, this means that the longer the residence time, the more small amount of water and impurities in palm oil (Clarified Oil) and oil content to the residence time (Retention Time) is directly proportional, this means the longer the time left then the more the amount of oil obtained in palm oil (Clarified oil)
2. The results obtained for the percentage of dirt, water and oil contained in Clarified oil based on retention time variations as follows:
   Retention Time 3 hours: Dirt level 0.03 2%, Water level 0.614% and oil level 99.354%.
   Retention Time 4 hours: Dirt rate 0.029%, Water Rate 0.502% and oil rate 99.470%.
   Retention Time 6 hours: Dirt level 0.026%, Water level 0.475% and oil level 99.499%.

ACKNOWLEDGEMENTS

Thank you to the Industrial Chemical Technology Polytechnic Institute and the Director of PT. XYZ Review Unit which has provided research facilities.

REFERENCES

[1] H. Heryani, "PENENTUAN KUALITAS DEGUMMED BLEACHED PALM OIL (DBPO)DAN REFINED BLEACHED DEODORIZED PALM OIL (RBDPO) DENGAN PEMBERIAN BLEACHINGEARTH PADA SKALA INDUSTRI," *Jurnal Teknologi Industri Pertanian*, vol. 29, no. 1, pp. 11–18, Apr. 2019, doi: 10.24961/j.tek.ind.pert.2019.29.1.11.

[2] S. N. Kristono, I. B. Rahardja, and A. Darmawan, "The Effect of Oil Thickness in the Cylindrical Settling Tank on the Moisture and Impurities of Crude Palm Oil (CPO)," *Journal of Applied Science and Advanced Technology Journal Homepage*, 2020, doi: 10.24853/JASAT.3.1.21-28.

[3] H. Heryani, "PENENTUAN KUALITAS DEGUMMED BLEACHED PALM OIL (DBPO)DAN REFINED BLEACHED DEODORIZED PALM OIL (RBDPO) DENGAN PEMBERIAN BLEACHINGEARTH PADA SKALA INDUSTRI," *Jurnal Teknologi Industri Pertanian*, vol. 29, no. 1, pp. 11–18, Apr. 2019, doi: 10.24961/j.tek.ind.pert.2019.29.1.11.

[4] A. Syafrianti, Z. Lubis, and J. Elisabeth, "Study of Crude Palm Oil (CPO) Handling and Storage Process in Palm Oil Mills in an Effort to Improve CPO Quality and Reduce the Risk of Contaminants Formation," 2021. [Online]. Available: www.journal.ugm.ac.id/v3/JFPA

[5] Herry Darmadi, "KEKUATAN DAN DAYA TAHAN PEGAS TERHADAP GETARAN BANDUL PADA VIBRATING SCREEN DI STASIUN PEMURNIAN PKS PT. X," *Jurnal Mekanova*, vol. 8, no. 1, pp. 73–85, 2022.

[6] S. N. Kristono, I. B. Rahardja, and A. Darmawan, "The Effect of Oil Thickness in the Cylindrical Settling Tank on the Moisture and Impurities of Crude Palm Oil (CPO)," *Journal of Applied Science and Advanced Technology Journal Homepage*, 2020, doi: 10.24853/JASAT.3.1.21-28.

[7] R. A. Renjani *et al.*, "PENGAMATAN KUALITAS CPO PADA STORAGE TANK DENGAN PENAMBAHAN SISTEM PENGADUKAN PADA BERBAGAI VARIASI TEMPERATUR THE ASSESSMENT OF CPO QUALITY IN STORAGE TANK WITH THE ADDITION OF A STIRRING SYSTEM AT DIFFERENT TEMPERATURE," *Jurnal Teknik Pertanian Lampung*, vol. 9, no. 4, pp. 343–352, 2020, doi: 10.23960/jtep-l.v9.i4.343-352.

[8] R. Melysa, Z. Fiqri, and A. Musnal, "OPTIMIZING OIL PRODUCTION AT THE GATHERING STATION BY MAINTAINING THE OIL STOCK TANK / INTERFACE LEVEL IN THE WASH

E-ISSN 2962-4274

TANK USING THE ROC SYSTEM (OPTIMASI PRODUKSI MINYAK PADA GATHERING STATION DENGAN MENJAGA OIL STOCK TANK / INTERFACE LEVEL PADA WASH TANK DENGAN MENGGUNAKAN SYSTEM ROC)," *Journal Renewable Energy & Mechanics*, vol. 4, no. 1, pp. 23–31, 2021, doi: 10.25299/rem.2021.vol4(01).5772.

[9] K. O. Purnama, D. Setyaningsih, E. Hambali, and D. Taniwiryono, "Processing, Characteristics, and Potential Application of Red Palm Oil - A review," *International Journal of Oil Palm*, vol. 3, no. 2, pp. 40–55, May 2020, doi: 10.35876/ijop.v3i2.47.

[10] R. A. Renjani *et al.*, "PENGAMATAN KUALITAS CPO PADA STORAGE TANK DENGAN PENAMBAHAN SISTEM PENGADUKAN PADA BERBAGAI VARIASI TEMPERATUR THE ASSESSMENT OF CPO QUALITY IN STORAGE TANK WITH THE ADDITION OF A STIRRING SYSTEM AT DIFFERENT TEMPERATURE," *Jurnal Teknik Pertanian Lampung*, vol. 9, no. 4, pp. 343–352, 2020, doi: 10.23960/jtep-l.v9.i4.343-352.

[11] T. Mawarni, "Perhitungan Perolehan Crude Palm Oil (CPO) Pada Proses Pemurnian Di Stasiun Klarifikasi Pabrik Kelapa Sawit (PKS) PTPN II Pagar Merbau," *Ready Star 2*, pp. 85–89, 2019.